FORENSIC SCIENCE

COURSE DESCRIPTION

This course is an overview of how science is applied to solving crimes. Topics include history of forensic sciences, collecting of evidence, analyzing results and hands-on applications of many laboratory techniques used in solving crimes and identifying people and future careers. Jobs include forensic nurses, odontologists, pathologists, psychiatrists, medical examiners/coroners, forensic technicians, toxicologists, wildlife specialists, forensic engineers, accountants, computer specialists, aviation and construction accident investigators, forensic photographers, skull reconstructionists, document and polygraph examiners.

It is strongly recommended that administration and guidance follow the scope and sequence and course recommendations as listed.

Recommended Credits: 1

Recommended Grade Level(s): 11-12th

Number of Competencies in Course: 35

Note: This course may be offered for one unit of science credit if the health science teacher is highly qualified for science or for one unit of career and technical education credit.

Teachers who teach this course must hold proper endorsement and completed the state-approved 16 hours of biennial training within the first three years of teaching then 8 hours every two years.

INTEGRATION/LINKAGES

Math, Chemistry, Biology, Psychology, Sociology, English, National Health Occupations Students of America Guidelines, National Science Standards, and Industry Standards

FORENSIC MEDICINE

STANDARDS

1.0 The student will know and apply the academic subject matter required to understand the history and development of the field of forensic science.

2.0 The student will be aware of OSHA regulations, proper attire at the crime scene and in the forensic laboratory and safety guidelines that apply to biohazardous waste.

3.0 Students will examine the range of careers available in the forensic science and related fields.

4.0 The students will apply information gained about DNA, its structure and role to forensic science.

5.0 The student will be aware of procedures for collecting, preserving, securing forensic samples at the crime scene then having the samples analyzed in the crime laboratory.

6.0 Students will apply concepts of serology and toxicology as related to forensic science.

7.0 Student will demonstrate proficiency in identification of individuals and human remains to solve forensic cases.

8.0 The student will apply concepts to prove time since death.

FORENSIC MEDICINE

STANDARD 1.0

The student will know and apply the academic subject matter required to understand the history and development of the field of forensic science.

LEARNING EXPECTATIONS

The student will:

1.1   Examine the timeline and significant players in the field of forensic science.

1.2   Investigate the evolution of the crime lab from initial tests to modern instruments and describe all services offered by these labs.

1.3   Describe what is meant by physical evidence and give examples of each form.

1.4   Compare and contrast the decisions surrounding inclusion of admissibility of scientific evidence into the courtroom.

1.5   Describe how the scientific method is used to solve forensic problems.

PERFORMANCE INDICATORS: EVIDENCE STANDARD IS MET

The student will:

1.1a   Develop a research paper illustrating the history of forensic science.

1.1b   Orally report on the history of forensic science using National HOSA Research/ Persuasive Speaking guidelines.

1.1c   Draw a concept map linking the history and key events.

1.2   Construct a drawing of an ideal crime lab with all components from a current lab and a lab in the early years of forensic science.

1.3   Gather and classify evidence from a crime scene

1.3b   Identify types of evidence that can be found at a crime scene.

1.4   Summarize the court case decisions on admissibility of evidence into classroom and give a written presentation on findings

1.5   Evaluate cases for correct and incorrect usage of the scientific method to evaluate evidence.

SAMPLE PERFORMANCE TASK

- Role-play an interview giving the definition of forensic science and forensic scientist.

- Create an electronic slide presentation with key events in the history of forensic science.

- Using Career Health Display guidelines create an exhibit for demonstrating careers in forensic science.

- Create a timeline of the history of forensic science highlighting key discoveries.

- Critique case studies for types and classifications of evidence.

- Role-play situations when lab evidence would be admissible in court and when it might not be allowed.

FORENSIC SCIENCE

Standard 2.0

The student will be aware of OSHA regulations, proper attire at the crime scene and in the forensic laboratory and safety guidelines that apply to biohazardous waste.

LEARNING EXPECTATIONS

The student will:

2.1   Orally report on universal precautions, its history, and how these precautions differ from those used in medical settings.

2.2   Analyze OSHA guidelines that must be followed in forensic science.

2.3   Research safety guidelines that apply to biohazardous waste.

2.4   Research sources of biohazardous waste in forensic science.

PERFORMANCE INDICATORS: EVIDENCE STANDARD IS MET

The student will:

2.1   Research and prepare a through presentation on OSHA and universal precautions.

2.2   Score at 100% on OSHA test related to forensic careers and work area

2.3   Student will reenact scenarios to demonstrate skills related to safety at the crime scene and in the laboratory.

2.4   Construct an electronic or paper brochure and/or Web site to teach others on sources of biohazardous waste.

SAMPLE PERFORMANCE TASK

- Create a online discussion board and have students give input on OSHA precautions required at a crime scene and in the crime laboratory.

- Written test on OSHA and universal precautions related to crime scene and crime laboratory.

- Role-play situations in the crime lab that involve unsafe situations.

- Develop a training manual or mock Web page containing information about biohazard waste in forensic science.

FORENSIC MEDICINE

STANDARD 3.0

Students will examine the range of careers available in the forensic science and related fields.

LEARNING EXPECTATIONS

The student will:

3.1   Critique and create a oral, written and visual presentation of a forensic science career with respect to the following:

        A. Educational requirements

        B. Scope of practice

        C. Salary

        D. Job outlook

        E. Professional organizations

        F. Typical day in the life of

        G. Practice setting

        H. Code of ethics

3.2   Compare and contrast applicable national and/or state licensing, credentialing or registration requirements for forensic medicine careers.

3.3   Compare and contrast multiple levels of entry into forensic medicine careers.

.**PERFORMANCE STANDARDS: EVIDENCE STANDARD IS MET**

The student is able to:

3.1   Research and prepare a written and oral report on a selected career using a variety of resources.

3.2   Investigate and present information on the requirements for obtaining a national or state license, credential or registration for a selected career.

3.3   Create a career presentation using HOSA competitive guidelines on a particular career in forensic medicine.

SAMPLE PERFORMANCE TASKS

- Research assigned forensic careers.

- Use HOSA competitive event guidelines for career health display to present the assigned career.

- Use Clinical Specialty HOSA National competitive events guidelines to present a career with skills and competencies.

- Invite professionals from various forensic science careers into classroom to share job duties with students or use career presentations from Internet.

FORENSIC MEDICINE

STANDARD 4.0

The students will apply information gained about DNA, its structure and role to forensic science.

LEARNING EXPECTATIONS

The student will:

4.1   Apply the concepts of the molecular structure of DNA.

4.2   Analyze the isolation and extraction of cellular DNA.

4.3   Apply concepts of restriction digestion, gel electrophoresis, and PCR.

4.4   Investigate the uses of DNA in identifying or clearing potential suspects in crimes.

PERFORMANCE INDICATORS: EVIDENCE STANDARD IS MET

The student will:

4.1   Perform three laboratory tasks fundamental to forensic science: DNA isolation, restriction digestion, and gel electrophoresis.

4.2   Using the Internet, find and explore the DNA timeline and activities on DNA.

4.3   Examine examples of genetic engineering that yield health benefits. Using National HOSA Prepared Speaking Guidelines, present findings to class.

SAMPLE PERFORMANCE TASK

- Demonstrate an understanding of genetics with activities that focus on inheritance of genetic traits.

- Demonstrate proficiency in digesting the DNA and analyzing fragment after gel electrophoresis by completing Fingerprinting or similar laboratory experience.

- Prepare an oral report on the use of DNA in the criminal justice system.

- Compare and contrast the use of DNA in forensics on television shows and those described in real cases.

- The students will demonstrate proficiency in DNA isolation.

FORENSIC MEDICINE

STANDARD 5.0

The student will be aware of procedures for collecting, preserving, securing forensic samples at the crime scene then having the samples analyzed in the crime laboratory.

LEARNING EXPECTATIONS

The student will:

5.1   Demonstrate basic skills related to obtaining evidence at a crime scene.

5.2   Analyze methods for securing, searching, documenting, and collecting different types of samples (blood, fingerprints, tracks, trace, ballistics, impressions, documents, and other evidence).

5.3   Identify the purpose of each of the following scientific instruments used in forensic science: gas-chromatography, capillary electrophoresis, polymerase chain reaction, scanning electron microscope, and crime site imager.

5.4   Match methods and instruments with the proper forensic evidence, data, and outcome.

5.5   Evaluate the results from basic forensic data.

5.6   Differentiate between the national databases found nationally and internationally.

PERFORMANCE INDICATORS: EVIDENCE STANDARD IS MET

The student will:

5.1   Research and report on roles, responsibilities and procedures related to securing a crime scene.

5.2   Create an electronic slide presentation analyzing methods relating to collection and processing of crime scene evidence.

5.3   Match data from gas-chromatography, capillary electrophoresis, scanning electron microscope, and crime site imager with instrument.

5.4   Interpret laboratory results from a case history relative to forensic purposes.

5.5   Evaluate the procedure for accessing national and international forensic databases.

SAMPLE PERFORMANCE TASK

- Construct a flowchart to follow in securing the crime scene, searching, documenting, and collecting different types of samples.

- Role-play the proper procedures to follow in securing the crime scene, searching, documenting, and collecting different types of samples.

- Research and prepare National HOSA Forensic Medicine competition questions on tools for evaluating evidence.

- Present to the class examples of forensic instrumentation and their capabilities.

- Electronically research or take a field trip to the research and teaching facilities of a university or community college that has a polymerase chain reaction (PCR) machine, electron microscope, and /or gas-chromatography.

- Visit the virtual electron microscope on the Internet.

FORENSIC MEDICINE

STANDARD 6.0

Students will apply concepts of serology and toxicology as related to forensic science.

LEARNING EXPECTATIONS

The student will:

6.1   Demonstrate proficiency in analyzing blood to determine if a forensic sample is blood, if it is human or animal blood, and the blood type.

6.2   Analyze blood spatter for velocity, direction, and height of fall with explanation of pattern analysis.

6.3   Investigate presumptive serology tests.

6.4   Examine techniques that forensic toxicologist use to identify high profile drugs at crime scenes and in blood samples.

6.5   Critique the biological response that occurs in the presence of certain illegal substances and high profile drugs (such as cocaine, LSD and ecstasy).

6.6   Examine the emotional and financial impact of illegal substances on society and law enforcement.

PERFORMANCE INDICATORS: EVIDENCE STANDARD IS MET

The student will:

6.1   Compare and contrast artificial blood samples from a simulated crime scene.

6.2   Calculate the angle of impact for blood spatter and deduce the direction of travel.

6.3   Use luminol testing for sensitivity and Kastle-Meyer test to establish evidence of human blood.

6.4   Develop an electronic slide presentation illustrating how diverse drugs are identified.

6.5   Compare and contrast the biological response of the effect of miscellaneous drugs.

6.6   Determine the financial impact of illegal substances on the nation's taxpayers using the internet and other sources. Using national HOSA prepared speaking guidelines, present the finding to the class.

SAMPLE PERFORMANCE TASK

- Conduct a lab using simulated blood typing kit.

- Create a crime scene involving blood splatter having students locate the point of convergence, measure angles of impact, and determine direction of travel.

- Have students research high profile drugs.

FORENSIC MEDICINE

Standard 7.0

Student will demonstrate proficiency in identification of individuals and human remains to solve forensic cases.

LEARNING EXPECTAIONS

The Student will:

7.1   Differentiate between a male and female skeleton remains to determine sex, height, race, and age range.

7.2   Demonstrate proficiency in reading dental records.

7.3   Describe the three basic properties that all individual identification by fingerprints.

7.4   Compare and contrast fingerprint ridge patterns and apply them to the Henry-FBI classification.

7.5   Identify visible, plastic, and latent fingerprints from forensic samples.

7.6   Critique steps in facial reconstruction.

PERFORMANCE INDICATORS: EVIDENCE STANDARD IS MET

7.1   Use the three basic measurements of the os pubis to determine the sex of a pelvis.

7.2   Diagram the basic differences in the Caucasoid, Negroid, and Mongoloid skulls.

7.3   Using mathematical formulas, determine height by measuring long bone samples in the classroom.

7.4   Given a set of dental records or dental molds, formulate a hypothesis on the identification of victim.

7.5   Utilizing fingerprints obtained from classroom lab exercise, identify properties and ridge patterns.

7.6   Critique case studies of cases that have involved fingerprints as primary course of forensic evidence and present findings.

7.7   Use technology and/or hands-on activities to reconstruct faces.

<u>SAMPLE PERFORMANCE TASK</u>:

- Measure long bone samples and, using mathematical formulas, estimate height of fictional victim.

- If given human remains or bones from a lab kit, the student will determine age range, sex, race, and height.

- Obtain dental impressions from students, then, try to identify which student made which impression.

- Investigate the history of the use of fingerprints in criminology.

- Use Face 4.0 CD to reconstruct facial features of a perpetrator.

- Use facial reconstruction kits, such as Julius Caesar, to reconstruct facial features from a skull.

FORENSIC MEDICINE

Standard 8.0

The student will apply concepts to prove time since death.

LEARNING EXPECTATIONS

8.1   Identify and explain the stages of composition.

8.2   Compare and contrast the physical methods of determining time of death.

8.3   Identify life cycles of insects and how insects can be used to estimate post-mortem intervals.

8.4   Explore variables affecting the determination of time since death.

PERFORMANCE INDICATORS: EVIDENCE STANDARD IS MET

8.1   Analyze the stages of death through various experiments and demonstrations in the classroom.

8.2   Summarize the terminology related to determining time of death.

8.3   Investigate how cycle of blow flies can be used to determine post-mortem intervals.

8.4   Investigate all possible insect infestation at a crime scene.

8.5   Create a diagram outlining the variables that determine time since death.

SAMPLE PERFORMANCE TASK:

- Conduct a potato corpse activity using different sized vegetables to simulate loss of body temperature after death..

- Use various activities found on the Internet to examine the life cycle of blow flies.